MultiDSU
T1 DSU/CSU

Model MTT1DSU

User Guide

MultiTech® Systems

Class A
Manual Declaration

NOTE: This equipment has been tested and found to comply with the limits for a **Class A** digital , pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the User Guide, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

WARNING: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

MultiDSU User Guide

82083200 Revision A

Model MTT1DSU

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MultiDSU
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Chapter 1 - Introduction and Description

MultiTech® Systems

Introduction

The Multi-Tech Systems MultiDSU (Model number MTT1DSU) is a low cost, full-featured T1-FT1 Data Service Unit (DSU). The MultiDSU provides an interface between point-to-point T1 or Fractional T1 service and the end user's Data Terminal Equipment (DTE). This unit also provides Facility Data Link (FDL) support.

Housed in a compact, durable housing, the MultiDSU supports D4 or ESF framing and AMI or B8ZS line coding on the T1 Line and supports synchronous data rates from 56 kbps to 1.536 Mbps to the DTE. A single V.35 (Winchester 34-pin) physical interface is the Data port to the DTE device.

This unit enables you to run complete diagnostics (loopback tests on your T1 line or your local or remote DSU) from your PC or terminal.

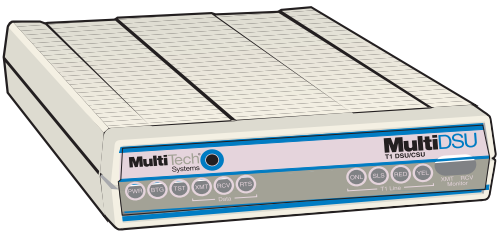

Figure 1-1. MultiDSU

About This User Guide

This user guide describes the MultiDSU and explains how to install and configure the unit. The information contained in each chapter is as follows:

Chapter 1 - Introduction and Description

Chapter 1 describes the MultiDSU and provides a review of this user guide. This chapter describes the front panel indicators and back panel connectors and switch. Applicable FCC regulations and a list of relevant specifications are provided at the end of the chapter.

Chapter 2 - Installation

Chapter 2 lists the safety warnings that are applicable to the MultiDSU then steps you through the process of unpacking your MultiDSU, connecting signal cables and power, and configuring your MultiDSU for operation.

Chapter 3 - Menu System

Chapter 3 describes the various options available on all the menus and submenus used to configure and operate the MultiDSU.

Chapter 4 - Remote configuration

This chapter provides instructions for modem-based remote configuration of the MultiDSU.

Chapter 5 - Diagnostics

Chapter 5 describes how to set up for, and perform, several types of diagnostic loopback tests for the MultiDSU.

Chapter 6 - Warranty, Service and Technical Support

Chapter 6 provides instructions on getting service for your MultiDSU at the factory, and includes a statement of the limited warranty and space for recording information about your MultiDSU prior to calling Multi-Tech's Technical Support. The final sections explain how to obtain technical support through our Web site and ftp site on the Internet or our fax-back system.

Front Panel

The front panel contains three sets of LEDs that provide the status of the MultiDSU and its data and T1 connections. The **Data** LEDs display the status and activity of the V.35 Data port. The **T1 Line** LEDs show whether the T1 Line is online or in a failure mode. Two monitor jacks enable you to monitor the T1 line with external test equipment.

Figure 1-1. Front Panel

PWR (Power) Lights when the power switch is in the "**1**" (On) position and the MultiDSU is powered by the external power supply.

BTG (Booting) Lights while the MultiDSU is booting.

TST (Test) Lights during diagnostic tests and during any loopback tests.

Data

XMT (Transmit) Lights when packets are being transmitted to the T1 line from the DTE device.

RCV (Receive) Lights when packets are being received from the T1 line by the DTE device.

RTS (Ready to Send) Lights whenever the DTE device is receiving RTS.

T1 Line

ONL (Online) Lights whenever a carrier signal is detected and no error conditions are present.

SLS (Sync Loss) Lights when there is a Loss of Sync in the input signal .

RED (Warning) Lights when there is a red alarm on the T1 line.

YEL (Warning) Lights when there is a yellow alarm on the T1 line.

Monitor jacks

XMT (Transmit) monitors transmit data on the T1 line.

RCV (Receive) monitors receive data on the T1 line.

Back Panel

All the cable connections for the MultiDSU are made at the back panel. The Line connector enables the MultiDSU to be connected to a T1 line from the local Telco central office (CO). The Command connector is used to configure the MultiDSU using a PC or terminal. The V.35 Winchester-type Data connector is connected through an adapter cable to a synchronous communications device such as a router. The power connector connects the external power supply to the MultiDSU. The back panel connectors are shown in Figure 1-2 and defined in the following sections.

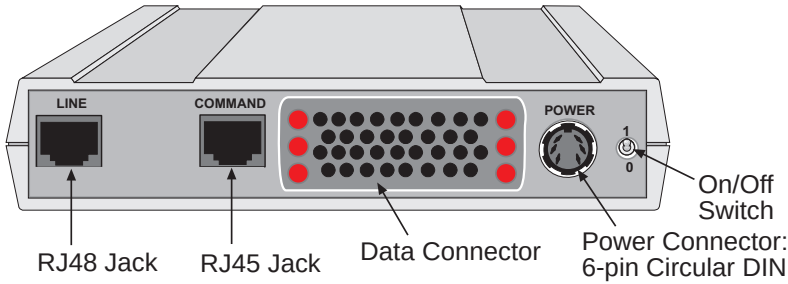

Figure 1-2. Back Panel

LINE Connector

The RJ48 Line jack is used to connect to a point-to-point T1 line from your local Telco or back to back to the Line jack of another MultiDSU.

COMMAND Connector

The RJ45 Command jack is used to connect the MultiDSU to a terminal or a PC operating in terminal mode, for configuration purposes.

Data Connector

The V.35 Data connector is connected to a synchronous communications (DTE) device such as a router.

POWER Connector

The Power connector is used to connect the external wall type transformer power supply to the MultiDSU. The wall transformer plugs directly into a grounded duplex AC outlet.

FCC Regulations for Telephone Line Interconnection

1. This equipment complies with Part 68 of the Federal Communications Commission (FCC) rules. On the outside surface of this equipment is a label that contains, among other information, the FCC registration number and ringer equivalence number (REN). If requested, this information must be provided to the telephone company.

2. As indicated below, the suitable jack (Universal Service Order Code connecting arrangement) for this equipment is shown. If applicable, the facility interface codes (FIC) and service order codes (SOC) are shown. An FCC-compliant telephone cord and modular plug is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack which is Part 68 compliant. See installation instructions for details.

3. The ringer equivalence number (REN) is used to determine the number of devices which may be connected to the telephone line. Excessive REN's on the telephone line may result in the devices not ringing in response to an incoming call. In most, but not all areas, the sum of the REN's should not exceed five (5.0).

   To be certain of the number of devices that may be connected to the line, as determined by the total REN's, contact the telephone company to determine the maximum REN for the calling area.

4. If this equipment causes harm to the telephone network, the telephone company will notify you in advance. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

5. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make

necessary modifications in order to maintain uninterrupted service.

6. If trouble is experienced with this equipment (the model of which is indicated below) please contact Multi-Tech Systems, Inc. at the address shown below for details of how to have repairs made. If the trouble is causing harm to the telephone network, the telephone company may request you remove the equipment from the network until the problem is resolved.

7. No repairs are to be made by you. Repairs are to be made only by Multi-Tech Systems or its licensees. Unauthorized repairs void registration and warranty.

8. This equipment cannot be used on public coin service provided by the telephone company. Connection to Party Line Service is subject to state tariffs. (Contact the state public utility commission, public service commission or corporation commission for information.

9. If so required, this equipment is hearing-aid compatible.

Manufacturer:	Multi-Tech Systems, Inc.
Trade Name:	MultiDSU
Model Number:	MTT1DSU
FCC Registration #:	AU7USA-25529-DE-E
Ringer Equivalence:	N/A
SOC Codes:	6.0N
Modular Jack	RJ48 for T1 connection
Service Center in USA:	Multi-Tech Systems Inc. 2205 Woodale Drive Mounds View, MN 55112 Voice (612) 785-3500 or (800) 328-97174 FAX (612) 785-9874

T1 Line

- Single T1 Line port with synchronous data format
- AMI or B8ZS line coding
- D4 Superframe or Extended Superframe framing support
- 1 to 24 channels at 56 kbps or 64 kbps each
- T1 line connector is an RJ48 jack

Data Port

- Single (V.35 DCE) port for synchronous data
- Operation at data rates from 56 kbps to 1.536 Mbps
- Local and remote loopback capability
- Extensive built-in test capabilities

Electrical/Physical/Environmental

- Voltage - 115v AC, 50/60 Hz (for power adapter)
- Power - 10 watts (est.)
- Dimensions - 6" W x 1.625" H x 9.00" L
  - 15.24 cm x 4.13 cm x 22.86 cm
- Weight - 2.0 pounds
- Temperature
  - Operating: - 32° to 122° F (0° to 50°)
  - Storage: - 4° to 158° F (-20° to 70°)
- Relative Humidity - Up to 95%, non-condensing

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Chapter 2 - Installation

MultiTech® Systems

Introduction

This chapter provides the safety warnings applicable to the MultiDSU and describes the unpacking of the MultiDSU, cable connections, and how to configure the unit dependent on your site situation. Once the MultiDSU is configured, then the Data port can be connected to your DTE device.

Safety Warnings

1. Never install telephone wiring during a lightning storm.

2. Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.

3. Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.

4. Use caution when installing or modifying telephone lines.

5. Avoid using a telephone (other than a cordless type) during an electrical storm. There may be a remote risk of electrical shock from lightning.

6. Do not use the telephone to report a gas leak in the vicinity of the leak.

Unpacking

The shipping box contains the MultiDSU, power adapter, Command port cable, and your user's manual. Inspect the contents for signs of any shipping damage. If damage is observed, do not power up the unit, contact Multi-Tech's Technical Support for advice (refer to Chapter 6 - Warranty, Service and Technical Support). If no damage is observed, remove all items from the box, place the MultiDSU in its final location, and connect your cables and power supply.

MultiDSU Configuration

Configuring the MultiDSU involves completing all the necessary connections, including connecting a cable between the MultiDSU and your DTE device, connecting your PC or terminal to the command port, connecting the point-to-point T1 line or back-to-back cable and power, setting up the PC or terminal to configure the MultiDSU, and finally configuring the MultiDSU using the Configuration procedure provided in this chapter.

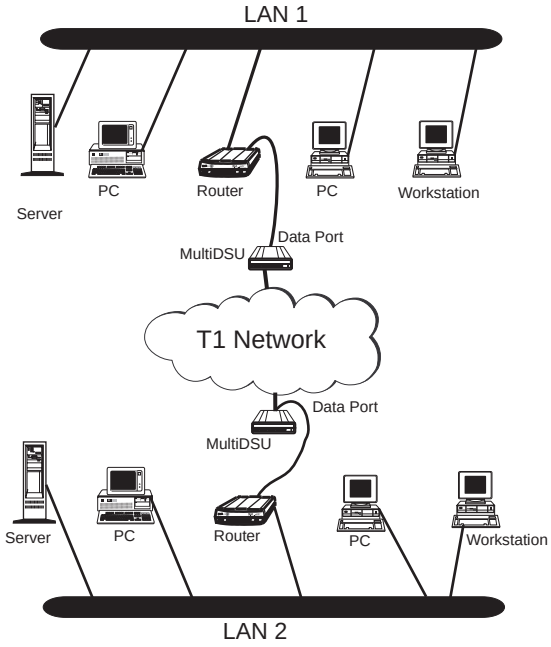


Figure 2-1. CSU Long Haul Application

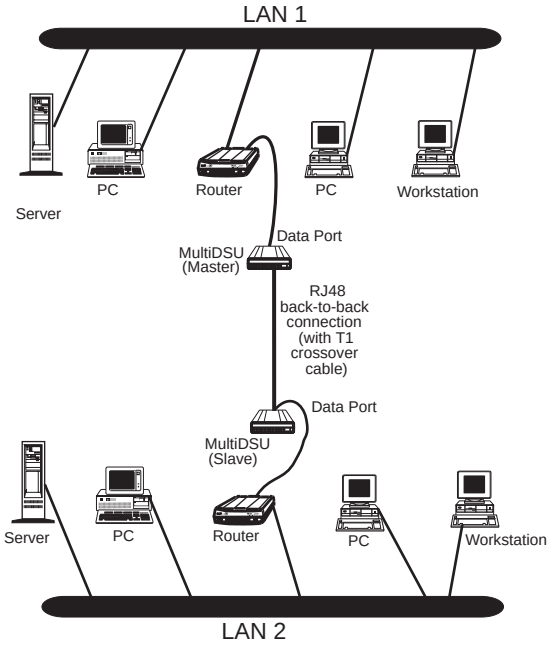


Figure 2-2. DSX-1 Short Haul Application (0 < 655 Feet)

Cabling Your MultiDSU

Cabling your MultiDSU involves making the proper Power, Command port, Line, and Data port connections. Figure 2-2 shows a typical application for the MultiDSU. Figure 2-3 shows the back panel connectors and associated cable connections, and Table 2-1 contains the procedures for connecting the cables to your MultiDSU.

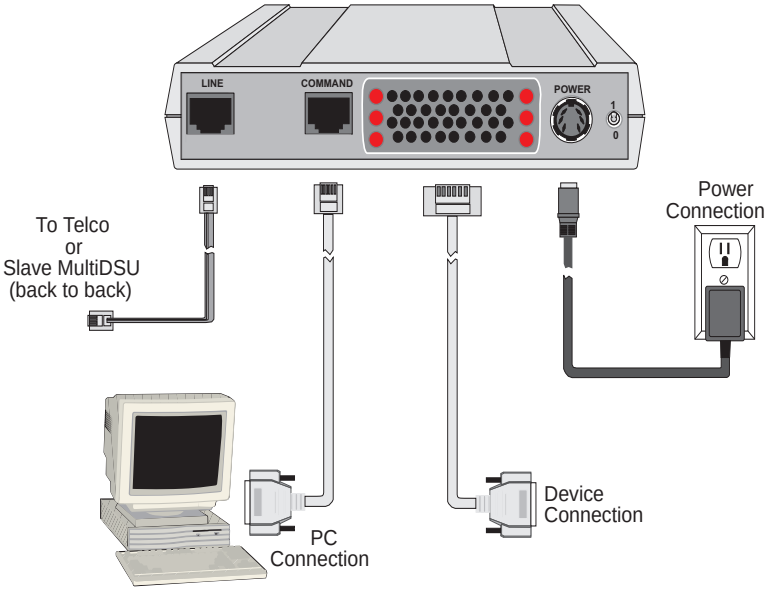


Figure 2-3. Cable Connections

Table 2-1. Cabling the MultiDSU

1. Connect a V.35 interface cable to the Winchester type Data connector on the back of the MultiDSU. Connect the other end of the cable to your DTE device (e.g., a router or frame relay access device). Refer to Appendix A for cable details.

2. Connect the special serial cable's RJ45 connector to the COMMAND jack on the back of the MultiDSU, then make sure the other end of this cable is connected to a serial (COM) port on your terminal or PC.
3. Connect the T1 line (or back-to-back cable) to the mating RJ48 LINE connector on the back of the MultiDSU.

4. Connect the external wall transformer power supply to the MultiDSU and plug it into a live AC outlet. When power is applied to the unit and the on/off switch is set to the up ("1" or On) position, the front panel LEDs will light.

5. Configure the unit in accordance with the procedures in the Configuration section that follows in this chapter.

6. After the MultiDSU is configured for your application, the Command cable can be disconnected from the MultiDSU and the terminal or PC and stored until the next time it is needed.

If you are connecting to a Telco, get the following T1 information from your Telco :

Line Code: AMI/B8ZS_____
Framing Format: D4/ESF_____
Available bandwidth: Full T1 (24 DS0s), or
Number of DS0s and which DS0 assignments, if FT1. _____

If you are using your MultiDSU as a short-haul modem, select the identical line coding and framing format to be used in both units.

Power up a terminal or PC running communications software. When the T1 DSU Main Menu appears on your screen, perform the procedures in the rest of this section, then run each of the loopback tests to check all the lines and interfaces.

1. Apply power to your terminal or PC. After the terminal or pc boots up, run communications software. Set up your communications software for 19.2K bps, 8N1 (8-bits, no parity, and 1-stop bit). Press the ENTER key to display the MultiDSU Main Menu.

```
T1 DSU Main Menu

 1. Configurations
 2. Current Status
 3. Statistics
 4. Diagnostics
 5. System Information

Enter Selection (-(previous), q(uit), <1>):  _
```

2. Enter option **1** and press the ENTER key to display the Configurations menu.

```
Configurations

   1. T1 Line Configuration
   2. DS0 Speed/DS0 Allocation
   3. Clocking
   4. V.35 Port
   5. Set configurations
   6. Set and Save configurations
   7. Reset to Factory Defaults

 Enter Selection (-(previous), q(uit), <1>):  _
```

3. Enter option **1** and press the ENTER key to display the T1 Line Configuration menu with options for Framing Format, Line Coding, and Line Type and Length.

```
T1 Line Configuration

   1. Framing Format           : D4 Superframe
   2. Line Coding              : Alternate Mark Inversion (AMI)
   3. Line Type and Length     : CSU (0db) or DSX-1 (0-133ft)

Enter Selection (-(previous), q(uit), <1>):  _
```

If any of these default selections (shown) are incorrect for your particular application, enter the corresponding option number to display the menu with the available alternate selections. (See substeps a through c.)

Make your new selection and press the ENTER key; you will then see your new selection displayed here. Repeat this process until the T1 Line is properly configured for your application.

a. Enter option **1** and press the ENTER key to display the two available Framing Format options -- D4 Superframe and Extended Superframe.

```
Framing Format

    1. D4 Superframe
    2. Extended Superframe

Enter Selection (-(previous), q(uit), <1>):  _
```

Enter option **2** and press the ENTER key to switch from the default D4 Superframe to Extended Superframe. If you then press the minus key "-" you will see the new selection displayed on the T1 Line Configuration menu.

b. Enter option **2** and press the ENTER key to display the two available Line Coding options -- AMI and B8ZS.

```
Line Coding

    1. Alternate Mark Inversion (AMI)
    2. Binary 8 Zero Substitution (B8ZS)

Enter Selection (-(previous), q(uit), <1>):  _
```

Enter option **2** and press the ENTER key if you need to switch from the default AMI to B8ZS. You will then see the new selection displayed on the T1 Line Configuration menu.

c. Enter option **3** and press the ENTER key to display the eight available selections for Line Type and Length.

```
Line Type and Length

    1. CSU (0db) or DSX-1 (0-133ft)
    2. DSX-1 (133-266ft)
    3. DSX-1 (266-399ft)
    4. DSX-1 (399-533ft)
    5. DSX-1 (533-655ft)
    6. CSU (7.5db)
    7. CSU (15db)
    8. CSU (22db)

 Enter Selection (-(previous), q(uit), <1>):  _
```

Select an option and press the ENTER key; you will then see the new selection displayed on the previous menu.

4. Press the minus key "-" and the ENTER key again to return to the Configurations menu.

```
Configurations

   1. T1 Line Configuration
   2. DS0 Speed/DS0 Allocation
   3. Clocking
   4. V.35 Port
   5. Set configurations
   6. Set and Save configurations
   7. Reset to Factory Defaults

 Enter Selection (-(previous), q(uit), <1>):  _
```

5. At the Configurations menu, enter option **2** and press the ENTER key to display the DS0 Speed/DS0 Allocation menu.

```
DS0 Speed/DS0 Allocation

   1. DS0 Speed                : 64Kbps
   2. DS0 Allocation           : 1-24

Enter Selection (-(previous), q(uit), <1>):  _
```

6. If the default speed, 64Kbps, is incorrect for your application, enter option **1** and press the ENTER key to display the DSO Speed menu. Enter option **2** (56Kbps) and press the ENTER key. this will return you to the updated DS0 Speed/DS0 Allocation menu.

```
DS0 Speed/DS0 Allocation

   1. DS0 Speed                : 56Kbps
   2. DS0 Allocation           : 1-24

Enter Selection (-(previous), q(uit), <1>):  _
```

7. Enter option **2** and press the ENTER key to display the DS0 Allocation menu. Enter a list of ranges; for example, if the Telco tells you to use DS0s 1-5, 7, 9 and 12-15, then enter "1-5,7,9,12-15" and press the ENTER key. This returns you to the updated DS0 Speed/DS0 Allocation menu.
8. Press the minus "-" key, then press the ENTER key to return to the Configurations menu.

```
Configurations

   1. T1 Line Configuration
   2. DS0 Speed/DS0 Allocation
   3. Clocking
   4. V.35 Port
   5. Set configurations
   6. Set and Save configurations
   7. Reset to Factory Defaults

 Enter Selection (-(previous), q(uit), <1>):  _
```

9. At the Configurations menu, enter option **3** and press the ENTER key to display the current selection (Internal, Line, or External). If you want to change to one of the other selections, press the ENTER key to display the three options. Use Line (option 2) if connected to a Telco T1 line. For a back-to-back setup, set one unit for Internal (option 1) (or External, option 3, if your DTE is providing the 1.544 MHz clock) and set the other unit for Line (option 2).

```
Clocking

   1. Internal
   2. Line
   3. External

Enter Selection (-(previous), q(uit), <1>):  _
```

Select one of the options from the Clocking menu, then press the ENTER key to display the following "1. Clocking: (new selection)." When done, press the minus key "-" and then the ENTER key to return to the Configurations menu.

```
Configurations

   1. T1 Line Configuration
   2. DS0 Speed/DS0 Allocation
   3. Clocking
   4. V.35 Port
   5. Set configurations
   6. Set and Save configurations
   7. Reset to Factory Defaults

 Enter Selection (-(previous), q(uit), <1>):  _
```

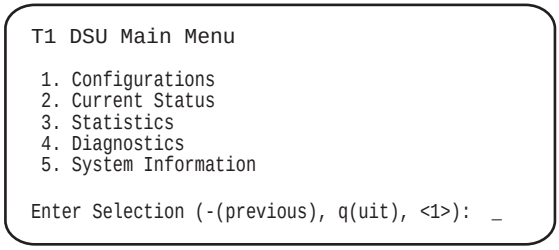
10. At the configurations menu, enter option **4** and press the ENTER key to display the RTS/DTR menu associated with the V.35 Data Port.

```
V.35 Port

   1. Force RTS                : Independent

Enter Selection (-(previous), q(uit), <1>):  _
```

11. To toggle RTS from "Independent" to "Forced," enter option number **1**, then press the ENTER key and select **2** (for Forced) and press the ENTER key. You will then see the updated V.35 Port menu. Use "Forced" if you want CTS to stay high as long as the carrier is high, regardless of the state of RTS; "Independent" means CTS will follow the state of RTS. When the selections are appropriate for your application, press the minus key "-" and then the ENTER key to return to the Configurations menu.

```
Configurations

   1. T1 Line Configuration
   2. DS0 Speed/DS0 Allocation
   3. Clocking
   4. V.35 Port
   5. Set configurations
   6. Set and Save configurations
   7. Reset to Factory Defaults

 Enter Selection (-(previous), q(uit), <1>):  _
```

12. Enter option **5** and press the ENTER key to set (implement) the configuration settings you have just completed. This will display "Configuration Setting Done" and you will be returned to the Configurations menu.
13. Enter option **6** and press the ENTER key to set AND SAVE the configuration settings you have just completed. This will also display "Configuration Setting Done."


T1 DSU Main Menu
1. Configurations
2. Current Status
3. Statistics
4. Diagnostics
5. System Information
Enter Selection (-(previous), q(uit), <1>): _

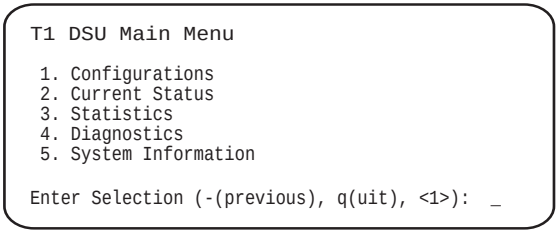
MultiDSU
T1 DSU/CSU

Chapter 3 - Menu System

MultiTech Systems

Introduction

The menu system for the MultiDSU provides a set of user-friendly configuration menus that are accessible from a main menu. The Main Menu contains four options that enable you to configure your MultiDSU, check the current operating status, display hourly and daily statistics, or run diagnostic tests; you can also exit (quit) the command mode from the Main Menu.



To select one of the four main options from the Main Menu, enter the number corresponding to the option and press the ENTER key to open the associated submenu.

Configurations Menu

The Configurations menu provides various options for configuring the T1 Line, including DS0 speed and allocation, selection of the source for clocking. This menu also enables the usere to select "Forced" or "Independent" RTS or DTR on the Data port. Other options enable the user to set the configurations, set and save them, or reset the unit to its factory defaults.

T1 Line Configuration Menu

This menu enables you to select the framing format, line coding, and line type and length to match the characteristics of the T1 line provided by your Telco or, for back-to-back connections to set the Master/Slave units to identical settings.

```
T1 Line Configuration

   1. Framing Format           : D4 Superframe
   2. Line Coding              : Alternate Mark Inversion (AMI)
   3. Line Type and Length     : CSU (0db) or DSX-1 (0-133ft)

Enter Selection (-(previous), q(uit), <1>):  _
```

Framing Format

The MultiDSU supports two types of framing formats: D4 Superframe (D4) and Extended Superframe (ESF).

The D4 Superframe option (option 1) is a 193-bit frame format in which the 193rd bit has framing and signaling information. A D4 superframe consists of 12 frames.
The Extended Superframe (ESF) option (option 2) is similar to D4 except that it consists of 24 frames instead of 12 frames and provides CRC error detection and a 4 kHz Facility Data Link (FDL).

Line Coding

The MultiDSU supports two types of line coding: AMI and B8ZS.

The Alternate Mark Inversion (AMI) option (option 1) is a bipolar coding scheme in which successive ones alternate in polarity to prevent a Bipolar Violation (BPV). A BPV occurs when two consecutive ones are the same polarity. When AMI is selected, the digital data stream from the user equipment on the data port is converted into this bipolar format to be transmitted over the T1 line.

The B8ZS option (option 2) is a coding technique used to satisfy the ones density requirements of the T1 carrier facilities while also allowing clear channel data. Since the system timing is recovered from the pulse width of the ones, it is important to ensure that there is an adequate proportion of ones in the data stream. If the data stream contains more than 8 consecutive zeroes - a condition that could disrupt system timing - B8ZS substitutes a predetermined pattern for the zeroes. This substitution intentionally causes a BPV to occur, alerting the unit on the receiving end that a substitution has taken place.

Line Type and Length

The line type and line length options enable the user to configure the MultiDSU to match the characteristics of the T1 line.

The default selection is CSU (0db) or DSX-1 (0-133ft). CSU is a long haul line type that allows the DSX-1 signal to be transmitted up to 6000 ft at Line Build Out (LBO) options of 0 dB, -7.5 dB, -15 dB, or -22.5 dB.

If the line type is DSX-1, you can select any of 5 available ranges of line length up to 655 ft, maximum. DSX-1 is a short haul line type often referred to as "cross-connect," especially within Telco central offices.

DS0 Speed/DS0 Allocation Menu

This menu enables you to configure the DS0 speed and (for Fractional T1 only) the DS0 allocation.

```
DS0 Speed/DS0 Allocation

   1. DS0 Speed                : 64Kbps
   2. DS0 Allocation           : 1-24

Enter Selection (-(previous), q(uit), <1>):  _
```

DS0 Speed

The default is 64Kbps clear channel communications; however, you can also select 56Kbps.

Each of the 24 DS0 signals in a full T1 is 64 kbps for a total bandwidth of 1.536 Mbps. When 8 kbps is added to the 24 DS0 time slots, the resulting data rate is 1.544 Mbps, which is referred to as the DS1 signal.

DS0 Allocation

This option enables you to configure the MultiDSU to match the bandwidth used. For full T1, use the default, "1-24." For Fractional T1 (FT1) enter the range(s) of DS0s available on your T1 line; e.g., "1-10" or "1-10,20-24." All the DS0s are assigned to the Data port of the MultiDSU.

Clocking Menu

This menu enables you to select the clock timing (Internal, Line, or External) for the MultiDSU. If you are connecting to a Telco, choose option 2, "Line." For a back-to-back setup, set one unit for Internal (option 1) (or External, option 3, if your DTE is providing the 1.544 MHz clock) and set the other unit for Line (option 2).

```
Clocking

   1. Internal
   2. Line
   3. External

Enter Selection (-(previous), q(uit), <1>):  _
```

V.35 Port Menu

Selecting option **4** on the Configurations menu displays the V.35 Port menu in which "Independent" is the default mode for RTS. "Independent" means CTS will follow the state of RTS. Toggle it to "Forced" if you want CTS to stay high as long as the carrier is high, regardless of the state of RTS.

```
V.35 Port

   1. Force RTS                : Independent

Enter Selection (-(previous), q(uit), <1>):  _
```

Set Configurations

The Configurations menu also enables you to "Set" any configuration changes you have made since last using this command (or since the unit was last powered On). Selecting option **5** and pressing the ENTER key displays the line, "Configuration Setting Done" and returns you to the Configurations menu. If the MultiDSU loses power, these settings will be lost.

Set and Save Configurations

The Configurations menu also enables you to "Set and Save" Configurations. Selecting option **6** and pressing the ENTER key displays the line, "Configuration Setting Done" and returns you to the Configurations

menu. Once they are saved, these settings will be retained if the MultiDSU happens to lose power or is turned Off.

Reset to Factory Defaults

The Configurations menu also enables you to reset the MultiDSU to the factory defaults by selecting option **7** and pressing the ENTER key.

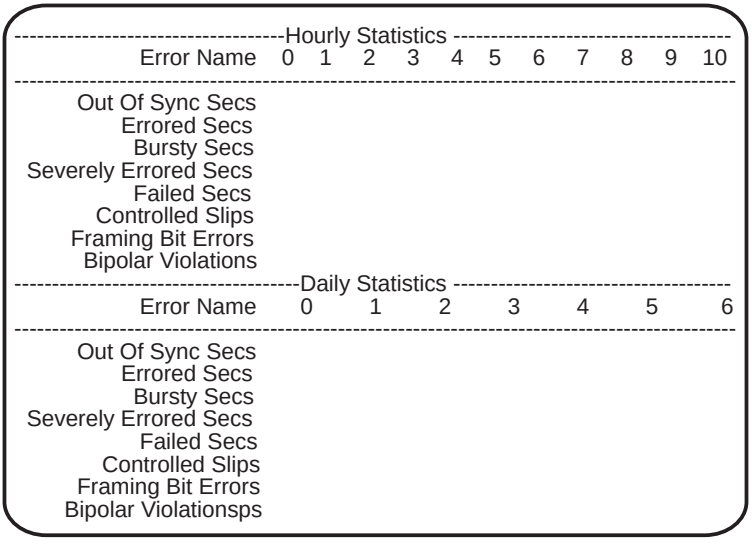
Current Status Screen

Selecting option **2** on the Main Menu displays the Current Status screen which displays the line status, receive level range, and the number of bipolar violations, framing bit errors, and out-of-sync multiframes. This screen enables you to see if any errors have occurred, and provides details concerning any current error status.

```
Current Status

   Line Status              :Red Alarm, Sync Loss

   Receive Level            :-15db to -22db

   Bipolar Violations       :150

   Framing Bit Errors       :1000

   Multiframes Out Of Sync  :10

 Press <Return> to display again or M to return to menu (M, <Return>):  _
```

Statistics

Selecting option **3** on the Main Menu displays the Statistics. This screen enables you to view any of eight different types of hourly or daily statistics. The Hourly Statistics are displayed first, followed by the Daily Statistics. From these performance data you can produce reports for the previous 24 hours in 15-minute increments. Following is the format of the Statistics screen:



The Statistics screen provides information concerning the operation of the MultiDSU that can aid you in testing for problems. The T1 Errors are defined in the following paragraphs:

Out Of Sync Secs

Out Of Sync Seconds (OOS) are seconds containing frames that could not be transmitted.

Errored Secs

Errored Seconds (ES) are seconds containing one or more ESF errors (i.e., one or more CRC6 errors or one or more OOFs).

Bursty Errored Secs

Bursty Errored Seconds (BES) are seconds containing 2 to 319 CRC6 errors.

Severely Errored Secs

Severely Errored Seconds (SES) are seconds with 320 or more CRC6 errors.

Failed Secs

Failed Seconds are seconds that failed due to one or more errors.

Controlled Slips

Controlled Slips (CS) occur when the receiving device either replicates or deletes a DS1 frame.

Framing Bit Errors

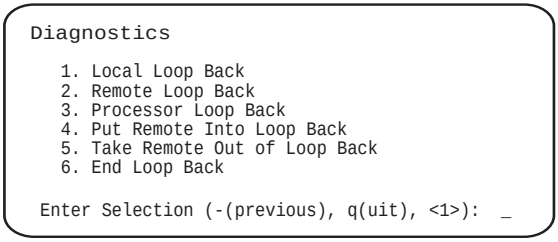
Framing Bit Errors (FBE), also called Out Of Frame (OOF) errors, are two frame bit errors in six consecutive frame bits.

Bipolar Violations

Bipolar Violations (BPV) occur when two adjacent bits are of same polarity.

Diagnostics

Selecting option 4 on the Main Menu opens the Diagnostics screen, with options for the various types of loopback tests that can be performed when a T1 crossover cable is connected between the LINE jacks on two MultiDSUs. The loopback tests are discussed in detail in Chapter 5 - Diagnostics.


Diagnostics
1. Local Loop Back
2. Remote Loop Back
3. Processor Loop Back
4. Put Remote Into Loop Back
5. Take Remote Out of Loop Back
6. End Loop Back
Enter Selection (-(previous), q(uit), <1>): _

System Information

Selecting option **5** on the Main Menu opens the System Information screen, which displays the firmware version number.

```
System Information

   Firmware Version            : Version 1.00

Press <Return> to continue:  _
```

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Chapter 4 - Remote Configuration

MultiTech® Systems

Remote configuration of the MultiDSU involves using modems to communicate from the local PC or terminal to the remote MultiDSU, where a special Remote Configuration Cable is used to link the receiving modem to the Command port of the MultiDSU.

Modem-Based Remote Configuration Procedure

1. At the remote site, connect a special cable (Remote Configuration Cable) to the Command port jack on the back panel of the MultiDSU and the RS232 connector on the modem. The special cable is a serial cable with male connectors on both ends. Refer to Appendix A for cable details.

2. Connect the modem to your local telephone line.

3. Provide your telephone number to the person verifying your configuration.

4. At the main site, connect your local PC to a modem that is connected to a dial-up line.

5. Apply power to your terminal or PC. After the terminal or pc boots up, run communications software. Set up your communications software for 19.2K bps, 8N1 (8-bits, no parity, and 1-stop bit) and call the remote modem.

6. Type "menu," then press the ENTER key to display the MultiDSU Main Menu.

7. When done, disconnect the Remote Configuration Cable from the modem and the MultiDSU at the remote location.

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Chapter 5 - Diagnostics

MultiTech® Systems

Introduction

MultiDSU diagnostics involve using the Diagnostics menus that are accessible through option **4** on the Main Menu. Option **4** opens the Diagnostics Menu that enables you to run loopback diagnostic tests on the MultiDSU and its connecting lines.

Setup for Diagnostic Loopback Tests

Connect a T1 crossover cable between the LINE jacks on two MultiDSUs. On the T1 Line Configuration menu, set up both units for the identical framing format (option **1**) and line coding (option **2**). Use the Clocking menu to set up one unit for Internal (option **1**) (or External, option **3**, if your DTE is providing the 1.544 MHz clock), then set the other unit for Line (option **2**). Run the appropriate loopback tests from the Diagnostics menu.

Diagnostics Methodology

The methodology for all the loopback tests is as follows:

1 Connect the DTE device to the Data port of the local MultiDSU.
2 Put the MultiDSU (either the local or remote) into the desired test mode.
3 Send data from the DTE device (local or remote).
4 Verify that the data received from the MultiDSU matches exactly what was sent.
5 If the data received matches the data that was sent, then the test passed. If the data received is corrupted or no data is received, then the test failed. A failed test indicates a problem with either the cables, connections, or one of the units involved in the test. If the cause of the failure is not readily apparent, try using the process of elimination to isolate the trouble spot(s). If there is still no clear cause of the problem, follow the steps provided in Chapter 6 to contact Tech support.

Diagnostics Menu

The Diagnostics menu enables you to run (and end) any of four different loopback tests, return to the previous menu, or exit (quit) the command mode.

```
Diagnostics

   1. Local Loop Back
   2. Remote Loop Back
   3. Processor Loop Back
   4. Put Remote Into Loop Back
   5. Take Remote Out of Loop Back
   6. End Loop Back

 Enter Selection (-(previous), q(uit), <1>):  _
```

Local Loop Back

The Local Loop Back option (option **1**) enables you to test the interface to the DTE device connected to the Data port of the MultiDSU. For this test, the local MultiDSU is put into loopback mode and any data coming into the MultiDSU from the DTE device is immediately looped back to the DTE device. See Figure 5-1. Use this test to verify that the Data port cable and its connections are OK, and that the MultiDSU's Data port settings are correct.

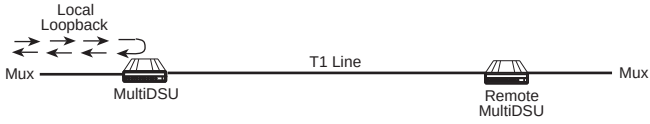

Figure 5-1. Local Loopback Test

Remote Loop Back

The Remote Loopback test (option **2** on the Diagnostics menu) checks the integrity of all the cables and connections between the local MultiDSU and the remote MultiDSU (at the other end of the T1 line) as well as checking the local MultiDSU's T1 Line transmit and receive circuitry. For this test, the local MultiDSU is put into loopback mode and any data coming into its T1 Line port is immediately looped back over the T1 line to the remote MultiDSU. See Figure 5-2.

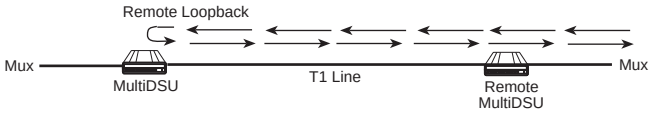

Figure 5-2. Remote Loopback Test

Processor Loopback

This test (option **3** on the Diagnostics menu) loops back the data in the MultiDSU's Central Processor Unit (CPU) and assures that the CPU and the T1 transceiver are communicating correctly. See Figure 5-3.

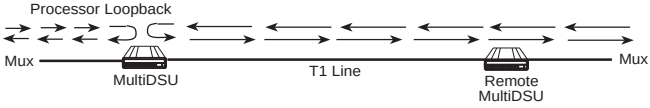

Figure 5-3. Processor Loopback Test

Put Remote Into Loop Back

This test (option **4** on the Diagnostics menu) checks the integrity of a remote MultiDSU by putting it into loopback mode so anything it receives over the T1 line is returned over the T1 line, through the local MultiDSU and out the Data port to the DTE device. See Figure 5-4. Select option **5** on the Diagnostics menu to take the remote out of loopback mode and end the test. Select option **6** to end loop back.

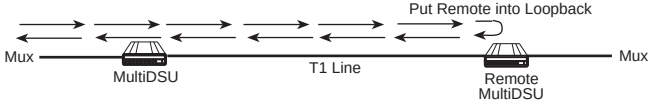

Figure 5-4. Put Remote Into Loopback Test

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Chapter 6 - Warranty, Service and Technical Support

MultiTech® Systems

Introduction

This chapter starts out with statements about your MultiDSU 2-year warranty. The next section, Tech Support, should be read carefully if you have questions or problems with your MultiDSU. It includes the technical support telephone numbers, space for recording your product information, and an explanation of how to send in your MultiDSU should you require service. The final sections explain how to use our bulletin board service (BBS), and get support through the Internet.

Limited Warranty

Multi-Tech Systems, Inc. (“MTS”) warrants that its products will be free from defects in material or workmanship for a period of two years from the date of purchase, or if proof of purchase is not provided, two years from date of shipment. MTS MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty does not apply to any products which have been damaged by lightning storms, water, or power surges or which have been neglected, altered, abused, used for a purpose other than the one for which they were manufactured, repaired by the customer or any party without MTS’s written authorization, or used in any manner inconsistent with MTS’s instructions.

MTS’s entire obligation under this warranty shall be limited (at MTS’s option) to repair or replacement of any products which prove to be defective within the warranty period, or, at MTS’s option, issuance of a refund of the purchase price. Defective products must be returned by Customer to MTS’s factory transportation prepaid.

MTS WILL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES AND UNDER NO CIRCUMSTANCES WILL ITS LIABILITY EXCEED THE PURCHASE PRICE FOR DEFECTIVE PRODUCTS.

On-line Warranty Registration

If you would like to register your MultiDSU electronically, you can do so at the following address:

http://www.multitech.com/register/

Service

If your tech support specialist decides that service is required, your MultiDSU may be sent (freight prepaid) to our factory. Return shipping charges will be paid by Multi-Tech Systems.

Include the following with your MultiDSU:

- a description of the problem.
- return billing and return shipping addresses.
- contact name and phone number.
- check or purchase order number for payment if the MultiDSU is out of warranty. (Check with your technical support specialist for the standard repair charge for your MultiDSU.)
- if possible, note the name of the technical support specialist with whom you spoke.
- If you need to inquire about the status of the returned product, be prepared to provide the serial number of the product sent.
- Send your MultiDSU to this address:

MULTI-TECH SYSTEMS, INC.
2205 WOODALE DRIVE
MOUNDS VIEW, MINNESOTA 55112
ATTN: SERVICE OR REPAIRS

Also check with the supplier of your MultiDSU on the availability of loaner units and/or local service in your area.

About the Internet

Multi-Tech is a commercial provider on the Internet. If you prefer to receive service via the internet, you can contact Tech Support via e-mail at the following address:

http://www.multitech.com/support

Multi-Tech's presence includes a Web site at:

http://www.multitech.com

and an ftp site at:

ftp://ftp.multitech.com

About the Multi-Tech Fax-Back Service

Multi-Tech's fax-back system provides 24-hour access to sales, marketing, and technical literature. Dial 612-717-5888, follow the voice prompts, and request document number 10 for a catalog of available documents. For convenence, have your fax number handy: _____ _____. From the catalog of available documents, you can order newsletters, white papers, press releases, etc. from the sales and marketing index, or order basic modem operation and trouble-shooting guides from the technical support and engineering index. Just enter the applicable FB Doc. # from the left column of the catalog.

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Appendixes

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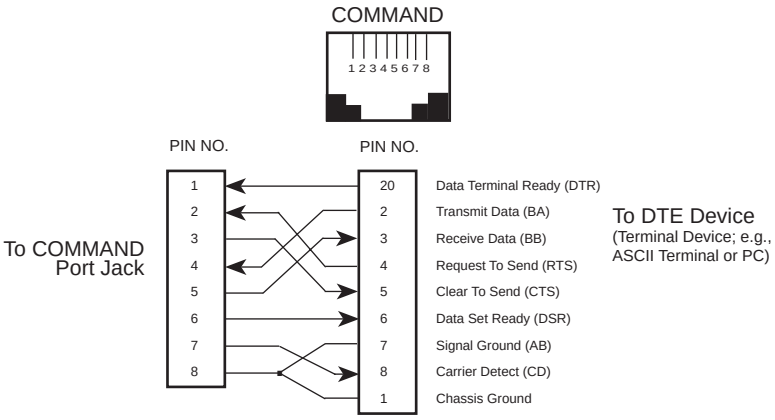
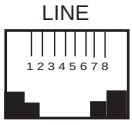
Command Port Cable



Line Cable

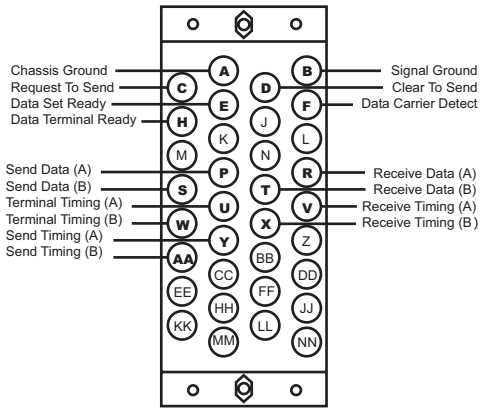


RJ48 Jack

Pin	Signal Name
1	Receive Ring
2	Receive Tip
4	Transmit Ring
5	Transmit Tip

Data Cable

V.35 34-PIN CONNECTOR



As viewed from the connector side
(rotated clockwise 90 degrees).

MultiTech
Systems